Measuring Inequities in Global Non-Hodgkin Lymphoma Burden: A Survival-Adjusted Analysis Across 29 Countries Using GBD 2021

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Introduction

Non-Hodgkin lymphoma (NHL) is a major global cause of cancer-related morbidity and mortality, with wide variation across regions and socioeconomic development levels. While incidence has increased globally, improvements in survival and disability reduction remain inconsistent. This study analyzes long term trends in NHL burden across 29 countries from 1990 to 2021 using Global Burden of Disease (GBD) 2021 data, introducing novel metrics to assess survival-adjusted disparities.

Aim

To quantify cross-national inequities in the global burden of non-Hodgkin lymphoma (NHL) from 1990-2021 using GBD 2021 data by introducing survival-adjusted measures–DALYs-per-case and the Burden-to-Survival Disparity Index (BSDI = DALY/ASMR)–and to identify countries and regions where rising burden is not matched by survival gains.

Objectives

- Compare BSDI and DALYs-per-case across 29 countries and over time (1990-2021) to detect survival-adjusted disparities and rank outliers with the greatest gap between burden and survival.
- Quantify temporal trends in ASIR, ASMR, DALYs using EAPC (log-linear) with 95% uncertainty intervals, and map inflection points that signal epidemiologic transition.
- Decompose changes in DALYs into YLL vs YLD contributions to reveal whether burden is driven by mortality or survivorship-related disability.
- Assess sex-specific and SDI-stratified gradients for BSDI and DALYs-per-case; estimate absolute and relative inequality (e.g., Slope Index of Inequality, Relative Index of Inequality) across SDI quintiles.
- Identify countries on or off the best achievable frontier (lowest BSDI at given ASIR/ASMR), highlighting systems that convert incidence control into survival and disability reduction most efficiently.
- Examine correlations of BSDI and DALYs-per-case with macro-level covariates available in GBD (e.g., SDI components) to contextualize health-system performance.
- Perform sensitivity analyses (age-standardization checks, alternative DALY denominators, compare cross-country rankings and trends.

Methods

We extracted age-standardized incidence rate (ASIR), mortality rate (ASMR), and disability-adjusted life years (DALYs) from GBD 2021, stratified by sex, region, and Sociodemographic Index (SDI). DALYs-per-case and burden-to-survival disparity index (BSDI = DALY/ASMR) were calculated to assess cross-national variation in treatment equity and disease trajectory.

Results

Globally, incident NHL cases rose from 255,667 in 1990 to 604,554 in 2021 (+136.4%), with deaths increasing by 82.1% and DALYs by 49.6%. Despite this, the age-standardized DALY rate declined by 16.8%. ASIR rose from 6.08 to 7.14 (+17.4%), and ASMR declined from 3.61 to 3.19 (−11.6%). The highest 2021 ASIRs were in Germany (16.41), Australia (15.90), and the UK (15.84). ASMRs were highest in the USA (4.56), Russia (4.21), and Argentina (3.65). South Korea showed the steepest ASIR rise (+82%), while Canada had the largest ASMR drop (−28.2%).

DALYs-per-case ranged from 6.3 (Canada) to 59.2 (Pakistan), and BSDI was highest in Eastern Europe, Sub-Saharan Africa, and South Asia. YLL rates declined by 20.4% in males and 14.6% in females, while YLD rates rose by 46.5% and 39.5%, respectively, reflecting improved survival but increasing chronic burden.

Conclusion

This is the first study to benchmark BSDI and DALYs-per-case across NHL-endemic countries. These metrics revealed hidden inequities missed by traditional indicators, exposing regions where patients suffer longer without survival benefit. Integrating such measures into global cancer reporting may better inform equitable resource allocation, especially in settings where stable ASMRs mask treatment inaccessibility.

References

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